NEW FROM MARTIN RESEARCH . . .

As the microprocessor revolution continues, microcomputers find their way into an ever-widening variety of applications. Our *silver box*– –a versatile industrial control package– – is a case in point, since it puts high-power computer technology to work in a low-cost controller. Detailed on page 3, the *silver box* is a logical development in the *modular micro* series from Martin Research.

Other new products featured in this brochure:

- The new *DEBUG* version of the 8080-based *MIKE 3,* a low-cost development system with single-step and 32-channel oscilloscope display *(page 1)*
- New special-purpose boards in the *modular micro* series: a serial communications board; a battery-backed power supply; and a control interface module *(page 3)*
- The revised Second Edition of *Microcomputer Design,* now only $25.00 *(page 2)*

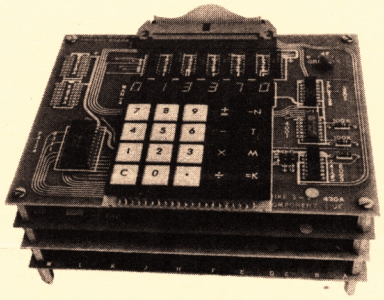
MODULAR MICROS . . .

The *modular micros* from Martin Research provide all the advantages of microprocessor technology. These versatile printed circuit modules communicate via a bus structure; compatible with:

- The *MIKE 3* series, based on the industry standard 8080
- The *MIKE 2,* based on the 8008—for small industrial controllers
- Upcoming *modular micros* based on the 6800/6500-series processors

MODULARITY . . .

Our design philosophy: *cost-effective modularity.* The CPU board, housing the microprocessor, provides the basic control signals needed for the system. Then, each memory, I/O, or peripheral interface board contains all the logic unique to its special function. Nearly all the costs associated with a keyboard, for example, are on that keyboard module--and the user does not pay for it until a keyboard is needed. Still, the bus structure is designed for complete flexibility, allowing the full potential of the microprocessor to be put to work as new functions are added.



THE MIKE 3 . . .

The *MIKE 3* typifies the *modular micro* approach. An optimal small system, yet fully expandable. The AT813 is a three-board system, based on the Model 471 CPU board, with an 8080A microprocessor. *(For complete description, see page 4.)* The system comes with a Model 420 Console board, featuring a calculator-style keyboard and six fully-decoded LED digits. The third board is a Model 423 PROM/RAM board, with 512 bytes (½K) of RAM and a versatile MONITOR program in a PROM. The MONITOR allows the user to program the computer with the keyboard, visualizing the results on the LED digits. (The 423 board has capacity for up to 1K of RAM and 2K of PROM.) An ideal small system for prototyping and for educational use, the AT813 lists for only $395.00, fully assembled and tested.

NEW DEBUG SYSTEM!

Martin Research takes pride in announcing the AT814, a *MIKE 3* computer featuring a powerful but low-cost diagnostic package. Designed for use in development, trouble-shooting, and educational applications, the 814 is one of the most powerful basic development systems available today.

DEBUG PROM . . .

This software package supplements the *MIKE 3 MONITOR* by allowing the user to step through programs one instruction at a time, using the console keyboard. Unlike the step/run switch on other computers, however — which simply deactivates the CPU between instructions—the *DEBUG PROM* maintains full processor activity. After executing each instruction, the user can inspect the status of every data register in the computer—any desired memory location (including the program stack) and the 8080's *internal* registers and flags! Or, the user can set a breakpoint at any desired location, even a point in PROM or ROM memory.

32-Channel Scope Display

The 32-Channel Microprocessor Data Display allows the user to inspect all important computer signals on an external single-trace, triggered sweep oscilloscope, 16 channels at a time. When a switch on the Model 472 Debug Board is pressed, the 16 address lines are displayed; otherwise, the data bus and selected control signals appear on the scope. Two probes on the 472 board may be used to trace any desired signals in the computer.

The AT814 comes with the 472 Debug board (with space for custom interface circuitry), 471 CPU board (with 8080A), console board, and 423 PROM/RAM board (MONITOR and *DEBUG* PROMs, and ½K of RAM). Fully assembled and tested, the AT814 lists for $495.00.

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SELECTED PRICES

MODULAR MICRO SYSTEMS

SERIES	MIKE 2	MIKE 3		
MODEL AT-	804-5	811	813	814
MICRO-PROCESSOR	8008-1	8080A	8080A	8080A
CPU BOARD	441-5	471-3	471-3	471-3
CONSOLE BOARD	✓	✓	✓	✓
PROM/RAM BOARD	✓	✓	✓	✓
BYTES OF RAM	¼K	1K	½K	½K
MONITOR PROM	✓	✓	✓	✓
DEBUG PROM	----	----	----	✓
DEMO PROM	----	✓	----	----
32-CHAN. DISPLAY	----	----	----	✓
BREAD-BOARD	✓	✓	----	----
I/O KITS	----	TWO	----	----
U.S. PRICE	$359	$495	$395	$495

All systems assembled and tested, with connectors, hardware, Manual. Power supply extra.

HIGH-SPEED PRINTER

110-CPS PRINTER	CAT. # PR11000	WITH EIA INTERFACE	$1600

DISCOUNTS

AMOUNT OF ORDER	DISCOUNT
$2000 UP	7%
$6000 UP	14%
$20,000 UP	20%

SPECIAL RATES FOR LITERATURE. WRITE FOR INFO.

MICROCOMPUTER LITERATURE

DESCRIPTION	CAT. NO.	COMMENTS	PRICE
MICROCOMPUTER DESIGN	LC Cat. # 76-1530	*2nd Edition,* 416 pages	$ 25
MIKE 3 MANUAL	MN811	FOR 8080 SYSTEMS	$ 20
MIKE 2 MANUAL	MN804	FOR 8008 SYSTEMS	$ 15
MODULAR MICRO BOARDS (AT = ASSEMBLED AND TESTED)			
8080 CPU BOARD	AT471-3	WITH 8080A	$149
8008-1 CPU BD.	AT441-5	WITH 8008-1	$ 99
PROM/RAM BD.	AT423-1	DECODERS, NO MEMORY	$ 78
4K RAM BOARD	AT405-4	450 NS SPEED, 4K BY 8	$195
8080 DEBUG BD.	AT472-2	32-CH. DISPLAY, ALL CONNECTORS	$ 89
CONSOLE BOARD	AT420	KEYBOARD, DECODED DIGITS	$ 92
SERIAL COMMUNI-CATIONS BOARD	AT424-2	TELETYPE INTERFACE (MODEL 33, ETC.)	$ 59
SERIAL COMMUNI-CATIONS BOARD	AT424-4	2 UARTS, 50-19KB, EIA OR TTY	$179
BREADBOARD	BD425	PRINTED CIRCUIT BOARD ONLY	$ 15
SOFTWARE PACKAGES (IN PROM)			
MIKE 2 DEMO PROM	SP2210-21	DIGITAL CLOCK, RAM TEST, ETC.	$ 32
MIKE 3 DEMO PROM	SP2220-15	DIGITAL CLOCK, RAM TEST, ETC.	$ 32
MIKE 3 DEBUG PROM	SP2220-24	STEP/RUN, SET BREAKPOINTS	$ 32
WIREWRAP KITS (FOR BREADBOARD)			
I/O KIT	KT9001-1	ONE INPUT, ONE OUTPUT (PARALLEL)	$ 14
WIREWRAP SOCKETS	KT9002	14-40 PINS, 21 TOTAL	$ 28
SOLDER SOCKETS	KT9003	14-40 PINS, 21 TOTAL	$ 13
KEYBOARD INTERFACE	KT9005-2	ASCII KEYBOARD INP. OR INTERRUPT	$ 32

ORDER INFORMATION

U.S. ORDERS--BankAmericard and Master Charge accepted. Credit card, cashier's check, or money order will expedite service; personal checks must clear our bank before shipment. COD orders: shipping cost plus 85¢ COD charge added. Net 30 days for rated firms. Add 1% per month for overdue bills.

A handling charge of $1.00 applies to orders for less than $25.00. Shipping is free on prepaid orders; orders requiring billing will be charged for shipping at cost, FOB Northbrook. A street address is required for delivery of hardware; hardware orders requiring mail service: $2.00 for handling, insurance.

OUTSIDE THE USA--Minimum order, $25.00. Advance payment in U.S. funds required. A fixed handling charge of $2.00 applies to each order to cover customs form costs. Cost of shipping is additional; specify method desired. Write for an invoice in advance. Special rates for one copy of *MICROCOMPUTER DESIGN,* prepaid orders, including all charges: Canada, Mexico. . . .$27 (surface)

W. Europe, Central & S. America. . .$32 (AO air mail)

E. Europe, Asia, Africa, Pacific . . . .$35 (AO air mail)

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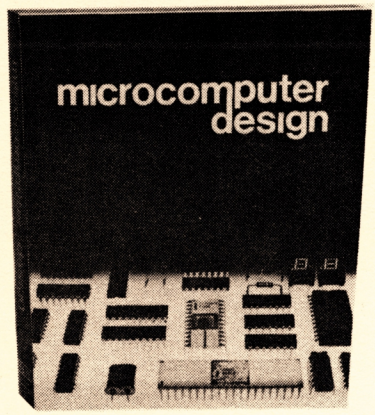

Thousands of copies of our innovative book on microprocessors, published in 1974, were purchased by engineers and designers around the world. . . .for $75 each. Now, *MICROCOMPUTER DESIGN* – revised, expanded, and reprinted in paperback –is available for $25.00! Over 400 pages on quality white text paper, including:

- *8080 circuits, theory of operation*
- *Vectored interrupts, for all 8-bit central processing units*
- *Efficient bus structure design*
- *Interfacing to timers, A/D converters, keyboards, digits, and other I/O devices*
- *Plus much more!*

MICROCOMPUTER DESIGN is well-suited for the engineer designing microprocessors into his company's products. Full schematics and circuit descriptions are provided for the 8080-based central processing unit of the *MIKE 3* microcomputer, in the *modular micro* series from Martin Research. Used as a textbook in many college courses, *MICROCOMPUTER DESIGN* is also a popular book with advanced home computer hobbyists.

- *15% discount for orders of 25.*
- *Educational rates available. Special school kit prices can be quoted for combinations of books and* modular micro *hardware for classroom use.*
- *Orders outside USA: see price information box at left.*
- *Dealership inquiries invited.*

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WHAT'S IN THE SILVER BOX?

We don't know!

. . . .until you tell us.

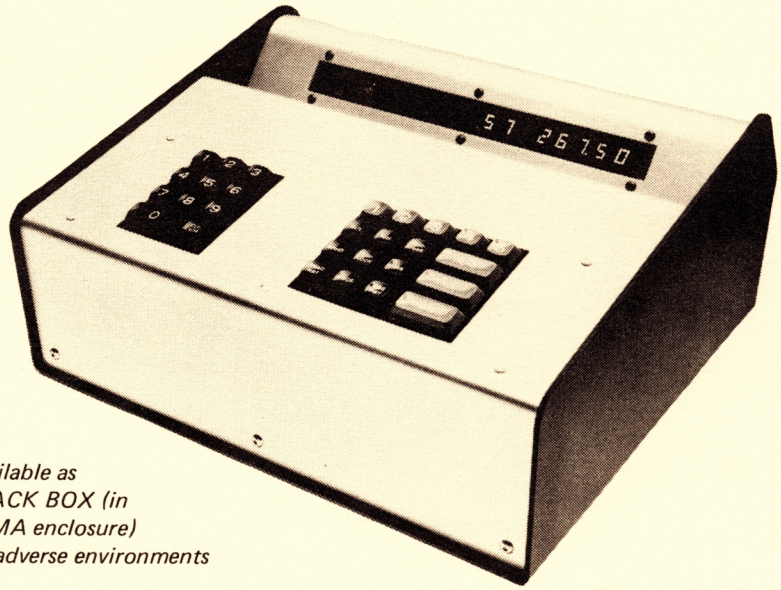
The *silver box* is our name for this versatile industrial control package. What's inside depends on *your* application. Based on a *modular micro* CPU board, the *silver box* may include a specialized keyboard and display panel; one or more memory boards, as required; software tailored to the job; and circuitry for interfacing with your system.

The *silver box* computer is linked with electrical devices which control a process, or sense a condition, or display information about the system. Examples: switches and relays; motors --AC, DC, and stepping; pressure transducers; thermometers; remote terminals; high-speed printers--the variety is endless.

Some current *silver box* applications suggest its versatility: a time accounting machine; an industrial batching controller; a vehicle dispatching terminal; and a multi-home security system.

Why Microprocessors in Industrial Control?

- *Versatility*--Once your basic product has been microcomputerized, adding new functions entails plugging in another circuit board or a new programmable memory element (with modified instructions)--not a whole new design.
- *Low cost*--Microprocessor-based control systems are not only much more powerful than older versions based on relays, motorized timers, or previous generations of electronic logic (such as TTL)--they are actually *more economical* in more and more applications today. Almost uniquely in today's inflationary economy, microcomputers are growing less and less expensive per control function performed.



Available as BLACK BOX (in NEMA enclosure) for adverse environments

Selected special features, for use with the *silver box:*

- *BATTERY-BACKED POWER SUPPLY*--A switching-regulator supply operating from 110/220 VAC, 50/60 Hz; includes a new sealed lead-acid battery pack, continuously charged when power is on. Allows system operation for 30 minutes or more after power loss; data retention for hours.
- *SERIAL COMMUNICATIONS BOARD*--The Model 424-4 converts eight-bit parallel microprocessor data format to serial data, allowing the computer to communicate with external devices over only one or several wires. With two UARTS, programmable baud rate, EIA or TTY voltage levels. Optoisolation is an optional extra. The 424-2 contains only the circuitry necessary to interface with an ordinary Teletype (w/o UARTs--but may be upgraded to a 424-4 merely by adding components).
- *CONTROL INTERFACE BOARD*--Interfaces between the microcomputer and industrial control circuitry. Drives standard solid-state relays; receives from switches, tachometers, etc., using high-impedance, noise-immune circuitry.

Putting Microprocessors into your Process. . .

A manufacturer using industrial control systems who is *not* looking at what microprocessors can do for him—will soon look like the manufacturer of a mechanical adding machine. Yet, only the largest companies can support a full-scale microcomputer development program—and even an all-out effort may take a year or more to put debugged circuit boards into production.

If this sounds like the problem *your* company faces, look into the *silver box* from Martin Research!

- Modular engineering ideal for expandable control systems.
- Prompt quotes on specialized system requirements.
- Fast turnaround on custom designs.
- Copies of PC board artwork, for your in-house production, available at reasonable cost.
- Full range of engineering services: consulting; production of key circuit boards: production of finished product.

OEMS. . . . THE SILVER BOX CAN CONTROL YOUR PROCESS! Tell us your application, and we'll quote costs of a custom-engineered computer control system.

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8080 CENTRAL PROCESSING UNIT
Model 471

The *471 CPU* is a complete 8-bit central processor on a single printed circuit board. Based on the 8080A microprocessor, the 471 generates the essential control signals for a complete *MIKE 3* microcomputer system.

The 471 supports the full capabilities of the 8080A microprocessor, including high speed--2.0 us instruction cycle--and memory addressing of up to 64K (65,536) bytes. The instruction set supports logical (Boolean), arithmetic, and bit-manipulating operations; the CPU can convert data to decimal (BCD) notation with a single instruction. Logical operations set flags which may be tested by conditional branch instructions to control program flow. For added convenience in memory addressing, six general-purpose internal registers may be addressed not only singly, but in pairs. There are also double-precision (16-bit) addition and increment/decrement instructions.

The 8080 stack pointer addresses external RAM memory, allowing for practically unlimited nesting of program subroutines. Through single-byte PUSH and POP instructions, registers, flags, and the program counter can be saved in the external stack, and restored later--greatly facilitating interrupt handling. The 471 includes circuitry for three interrupt levels, expandable to an eight-level prioritized interrupt system by adding an accessory circuit board. A digital timer restarts the computer automatically should the CPU fail to recognize interrupt requests for a set period.

Power bus drivers are included for driving expanded systems. However, control by the 8080A of the data and address busses may be suspended by a HOLD request, thereby allowing for direct memory access (DMA) or multi-processor operation.

The 471 includes a reliable crystal-controlled clock. Specialized control signals are developed on the CPU board and are present on the system bus to simplify expansion, by minimizing the extra interface circuitry needed on each new memory or input/output board. These signals not only include those required for 8080-type I/O instructions, but also support the 6800/6502 and 8008 I/O addressing modes. The 50-pin bus structure is compatible with these and other eight-bit processors, allowing the 471 to be used interchangeably with other CPU boards in interfacing to memory and accessory modules in the *modular micro* series.

While supporting all the potential of the powerful 8080A microprocessor, the Model 471 CPU board is a good example of the flexibility of the *modular micro* approach. Optimal for small systems--yet fully expandable.

APPLICATIONS

Industrial The flexible *modular micro* approach makes the Model 471 ideal for prototyping computers based on the 8080A microprocessor. The 471 is also attractive to the OEM for pilot runs and low-volume production, and can easily be adapted for specialized purposes. Ideal for a whole new generation of intelligent machines, including industrial controllers, computer peripherals, terminals, business machines, and many others.

Educational In design and packaging, the *modular micro* concept is well-suited for educational purposes. Used by university engineering and computer science departments in formal course work, and by engineers and programmers to keep up with the state of the art.